

WHAT IS CLAIMED IS:

1 1. An electrode deployment apparatus for treatment of tissue in a body
2 lumen, the apparatus comprising:

3 a plurality of electrodes arranged on a surface of a dimensionally stable
4 support at a pre-selected electrode density; and

5 an expansion member coupled to the support to deploy and selectively expose
6 a portion of the electrode surface while shielding a remaining portion and maintaining the
7 electrode density.

1 2. An apparatus as in claim 1, further comprising wiring adapted to
2 connect the electrodes to a radiofrequency power source as a multiplicity of bipolar pairs.

1 3. An apparatus as in claim 2, wherein the support comprises a non-
2 distensible, electrode backing.

1 4. An apparatus as in claim 3, wherein at least a portion of the electrode
2 backing is spirally furled about an axis of an expansion member prior to deployment.

1 5. An apparatus as in claim 4, wherein the electrodes are aligned in a
2 generally axial direction on the surface of the electrode backing.

1 6. An apparatus as in claim 4, wherein the electrodes are aligned in a
2 generally transverse direction on the surface of the electrode backing.

1 7. An apparatus as in claim 1, wherein the electrodes are linear and
2 arranged in a parallel pattern on the support.

1 8. An apparatus as in claim 1, wherein the electrodes are non-linear and
2 arranged in a parallel pattern on the support.

1 9. An apparatus as in claim 1, wherein the parallel electrodes have a
2 width in the range from 0.1 mm to 3 mm and a spacing in the range from 0.1 mm to 3 mm.

1 10. An apparatus as in any one of claims 1 to 9, wherein the expansion
2 member comprises an inflatable balloon.

- 1 11. An apparatus as in claim 10, wherein the inflatable balloon inflates
2 elastically.
- 1 12. An apparatus as in claim 10, wherein the support is furled at least
2 partially around the balloon, so that the support unfurls as the balloon is inflated.
- 1 13. An apparatus as in claim 12, wherein the support is furled in an
2 overlapping manner.
- 1 14. An apparatus as in claims 13, further comprising an elastic member
2 coupled to the support to retain the support in contact with the balloon.
- 1 15. An apparatus as in claim 12, wherein the support is attached at one end
2 to a surface of the balloon and a second end of the support is unattached and furled around
3 the balloon to overlap the first end.
- 1 16. An apparatus as in claim 12, wherein the support is attached at its
2 midpoint to a surface of the balloon, and first and second ends of the support are unattached
3 and furled in opposite directions around the balloon.
- 1 17. An apparatus as in claim 16, wherein the first and second ends of the
2 support overlap.
- 1 18. An apparatus as in claim 16, further comprising a second support that
2 is attached at its midpoint to a point on the balloon approximately opposite the midpoint of
3 the first support, the two ends of the second support overlapping the ends of the first support
4 as they are furled around the balloon.
- 1 19. An apparatus as in claim 10, further comprising a cylindrical container
2 having an axial slot whereas the furled support is within the container and a first end of the
3 backing passes through the slot and around the expandable balloon, the first end of the
4 support being attached to the container, wherein the support unfurls from the container as the
5 balloon is expanded.
- 1 20. An apparatus as in claim 19, wherein the support is attached to the
2 balloon at a location proximal to the slot.

- 1 21. An apparatus as in claim 19, wherein the support is folded into a
2 plurality of pleats inside the container.
- 1 22. An apparatus as in claim 19, wherein a second end of the support is
2 attached to a shaft, the backing being furled about the shaft.
- 1 23. An apparatus as in claim 22, further comprising a torsion spring
2 coupled to the shaft.
- 1 24. An apparatus as in any one of claims 1 to 9, wherein the expansion
2 member comprises a spiral spring.
- 1 25. An apparatus as in claim 24, wherein the spring comprises a spring
2 material selected from the group consisting of 316 stainless steel or nitinol.
- 1 26. An apparatus as in claim 24, wherein the support is attached to the
2 outside surface of the spring.
- 1 27. An apparatus as in claim 10, further comprising an adhesive applied to
2 selected areas of the backing, the backing folded over on one or more of the adhesive areas to
3 form one or more creases, wherein the creases expand to expose additional electrodes as the
4 balloon inflates.
- 1 28. The apparatus of claim 10, further comprising a shaft and a sheath,
2 wherein the support is attached at one end to a distal end of the shaft and spirally furled about
3 the shaft, wherein the balloon is slidably received on the shaft proximal to the support,
4 wherein the balloon and support are retained in the sheath so that they may be advanced past
5 the sheath once the apparatus is positioned at a treatment area, and wherein the balloon is
6 further advanced to the distal end of the shaft to expand the support.
- 1 29. An apparatus as in claim 1, further comprising a transesophageal
2 catheter, wherein the expansion member is disposed at a distal end of the catheter.
- 1 30. A system for treating tissue, said system comprising the apparatus as in
2 claim 29, and further comprising a RF power source coupled to the plurality of electrodes.

1 31. An apparatus as in claim 30, further comprising a multiplexer coupled
2 to the plurality of electrodes.

1 32. An apparatus as in claim 29, further comprising a control device
2 coupled to the plurality of electrodes, the control device providing controlled positioning of
3 the expandable member.

1 33. An apparatus as in claim 30, further comprising a temperature sensor
2 coupled to the plurality of electrodes.

1 34. A method for deploying electrodes to treat tissue in a body lumen, said
2 method comprising:
3 positioning an array of electrodes having a pre-selected electrode density
4 within the body lumen; and
5 exposing an area of the array sufficient to engage a wall of the lumen while
6 maintaining the electrode density, wherein the size of the exposed area will vary depending
7 on the size of the body lumen.

1 35. A method as in claim 34, wherein positioning comprises
2 transesophageally delivering the array to a treatment area within the esophagus.

1 36. A method as in claim 35, wherein transesophageally delivering the
2 array comprises advancing a catheter through the esophagus, wherein the catheter carries the
3 electrode array.

1 37. A method as in any of claims 34, wherein the array comprises a non-
2 distensible, electrode support that is furled about an axis and wherein expanding comprises
3 unfurling the support to selectively expose a portion of the available electrode area.

1 38. A method as in claim 37, wherein unfurling comprises expanding an
2 expansion member within the furled support.

1 39. A method as in claim 38, wherein expanding the expansion member
2 comprises inflating a balloon.

1 40. A method as in claim 39, further comprising:
2 furling the support about an axis so that its ends overlap each other;

3 coupling an elastic member to the support to retain the support from unfurling
4 freely;

5 placing the balloon within the circumference of the furled support;
6 advancing the support assembly to a desired treatment region; and
7 expanding the balloon to deploy the backing against a wall of the lumen.

1 41. A method as in claim 39, further comprising:
2 furling a support about the distal end of a shaft having the balloon slidably
3 received on the shaft proximal to the support;
4 placing the balloon and support inside a sheath;
5 positioning the sheath assembly near a treatment area;
6 advancing the balloon and support past the sheath;
7 advancing the balloon to the distal end of the shaft;
8 positioning the balloon and support at the treatment area; and
9 expanding the balloon to deploy the backing against a wall of the lumen.

1 42. A method as in any of claims 34 to 41, further comprising applying
2 radiofrequency energy to tissue of the body lumen through the electrodes.

1 43. A method as in claim 42, wherein the radiofrequency energy is applied
2 through a multiplicity of bipolar electrode pairs in the array.

1 44. A method as in claim 43, wherein the electrodes are parallel, have a
2 width in the range from 0.1 mm to 3 mm, and are spaced-apart by a distance in the range
3 from 0.1 mm to 3 mm.

1 45. A method as in claim 44, wherein the radiofrequency energy is
2 delivered at a total dosage in the range from 1 joules/cm² to 50 joules/cm².

1 46. A method as in claim 45, wherein the radiofrequency energy is
2 delivered over a time period below 5 seconds.